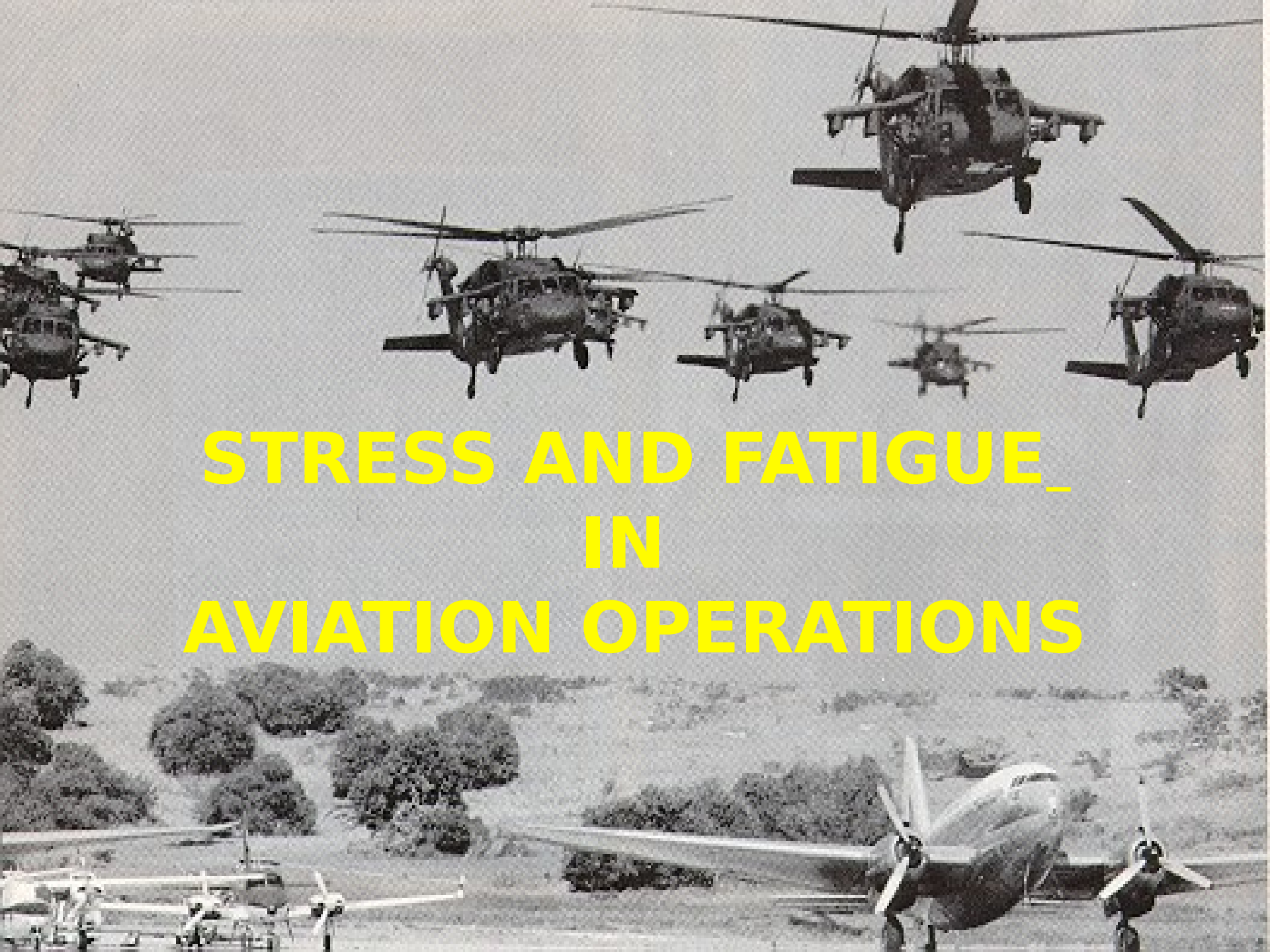


STRESS AND FATIGUE_
IN
AVIATION OPERATIONS

TERMINAL LEARNING OBJECTIVE

ACTION: **Manage the effects of stress and fatigue.**

CONDITION: **While performing as an aircrew member**

STANDARD: **IAW FM 3-04.301, DA Pam 600-24, FM 22-51, AR 95-1, Flight Stress, Fundamentals of Aerospace Medicine, Leader's Guide to Crew Endurance, Health Psychology**

ENABLING LEARNING OBJECTIVE #1

- **ACTION:** Select the three definitions of stress.
- **CONDITION:** Given a list.
- **STANDARD:** IAW FM 3-04.301, Flight Stress, and Health Psychology

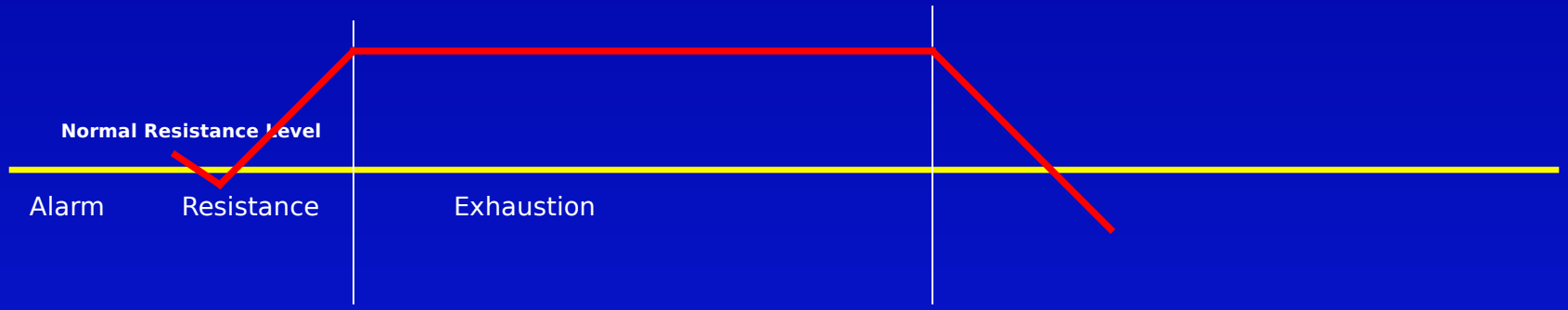
History of Research about Stress

- Walter Cannon (1932) – “Fight-or-flight”
  - Rapid arousal of the sympathetic nervous system and endocrine system
  - Provides the “rush” you feel when scared or surprised
  - Stress = the physiological rush

History of Research about Stress

- Hans Selye (1956) - “General Adaptation Syndrome”
  - “General” – nonspecific response
  - “Adaptation” – places a demand on body to adapt
  - “Syndrome” – no adaptation = pathology
  - Stress = the nonspecific response of the body to any demand placed upon it.
- Three stages
  - alarm, resistance, exhaustion

History of Research about Stress



- Alarm - organism is mobilized to meet threat
- Resistance - efforts to cope with threat
- Exhaustion - organism fails to meet threat

History of Research about Stress

- Lazarus (1968) – Psychological Appraisal:
  - Primary appraisal
    - determines meaning of the event (positive, negative, neutral)
    - If negative, assesses degree of harmfulness
  - Secondary Appraisal:
    - assessment of available coping resources
  - Stress = perceived threat > perceived coping

QUESTIONS

Q. What is Hans Selye’s definition of stress?

A. The nonspecific response of the body to any demand placed upon it.

ENABLING LEARNING OBJECTIVE #2

- ACTION: Select the signs and symptoms of stress.
- CONDITION: Given a list.
- STANDARD: IAW FM 3-04.301

Signs and Symptoms of Stress

- Physical
- Emotional
- Cognitive
- Behavioral

Physical Signs and Symptoms

Immediate

- Sweaty Palms
- ↑ Heart Rate
- Trembling
- Shortness of Breath
- Gastrointestinal Distress
- Muscle Tension

Long-term

- Sleep Problems
- Backaches
- ↑ Blood Pressure
- Immune System Suppression
- Fatigue
- Anxiety Disorders

Emotional Signs and Symptoms

- Irritability
- Hostility
- Anxiety
- Loss of Self-Esteem
- Feelings of Helplessness
- Anhedonia

Cognitive Signs and Symptoms

- Obsession or excessive worrying
- Decreased attention
- Impaired memory
- Poor judgment
- Poor psychomotor coordination

Behavioral Signs and Symptoms

- Late to work
- Poor performance
- Explosiveness
- Alcohol and/or other drug abuse
- Social isolation
- Suicide

QUESTIONS

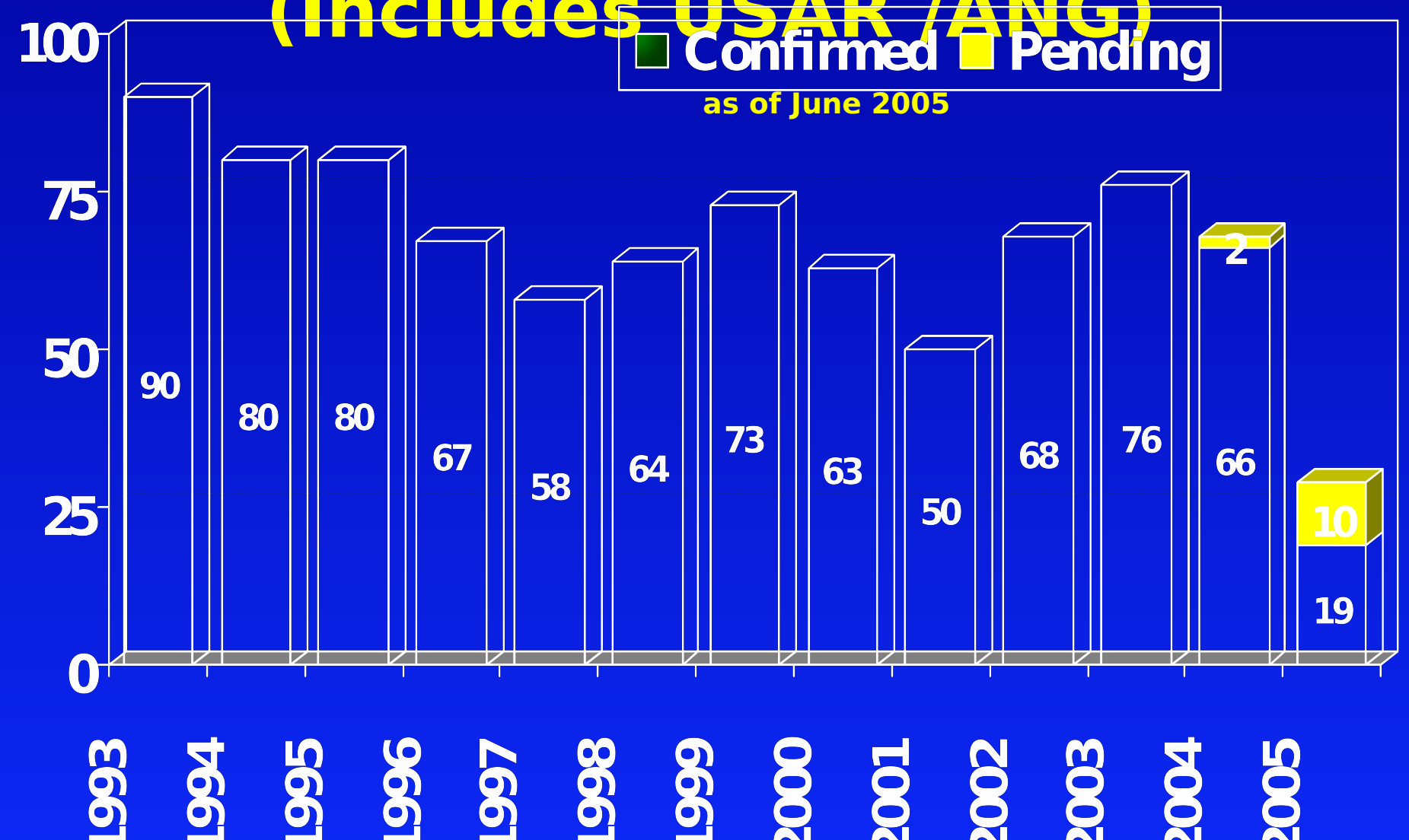
Q. What are two cognitive signs of stress?

A. Worry or decreased memory, attention, judgment, or psychomotor coordination

ENABLING LEARNING OBJECTIVE #3

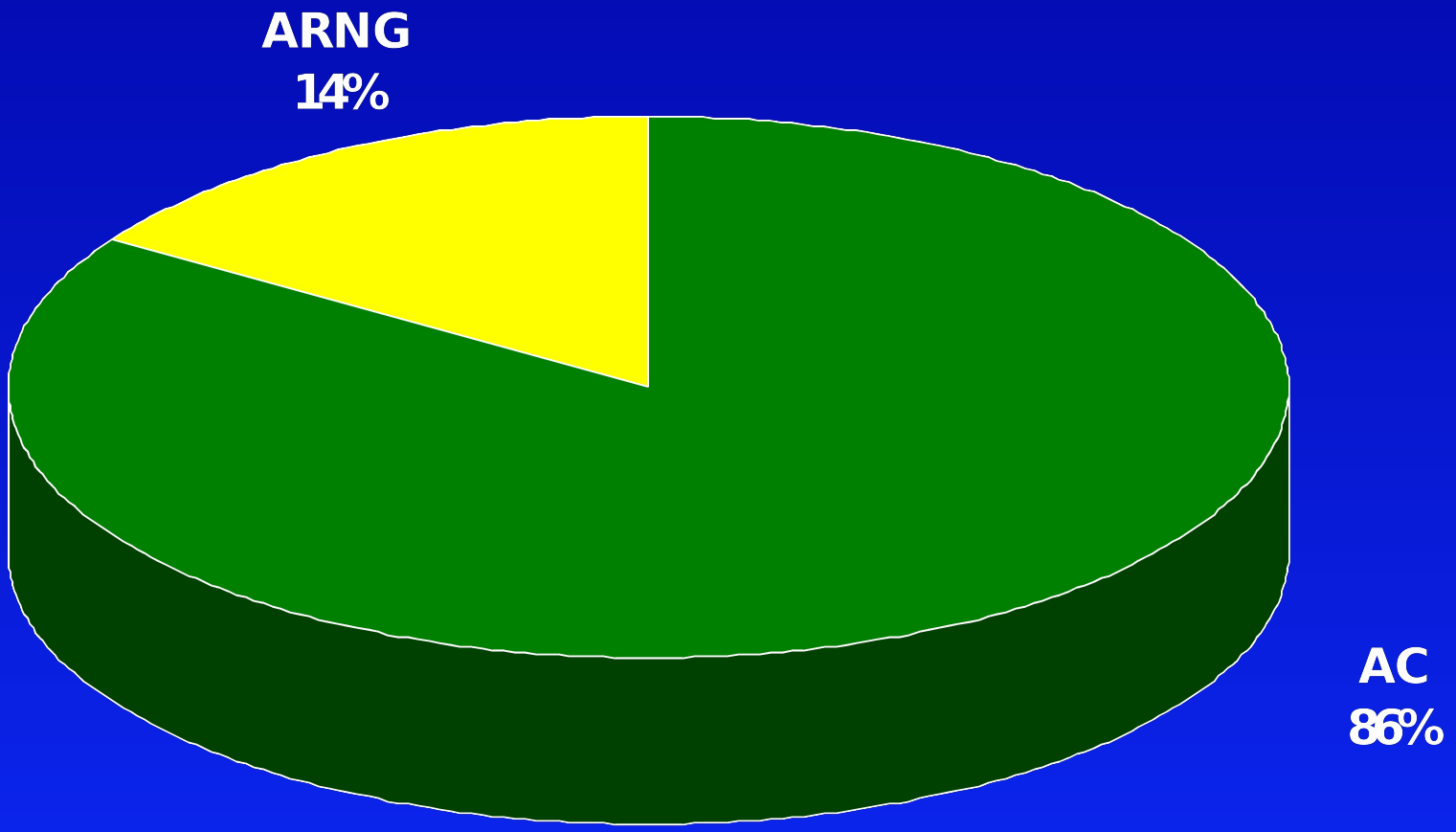
- ACTION: Select the correct actions to prevent suicide in a coworker who hints about suicide.
- CONDITION: Given a list of actions
- STANDARD: IAW DA PAM 600-24

CY Total Army Active Duty Suicides (Includes USAR /ANG)

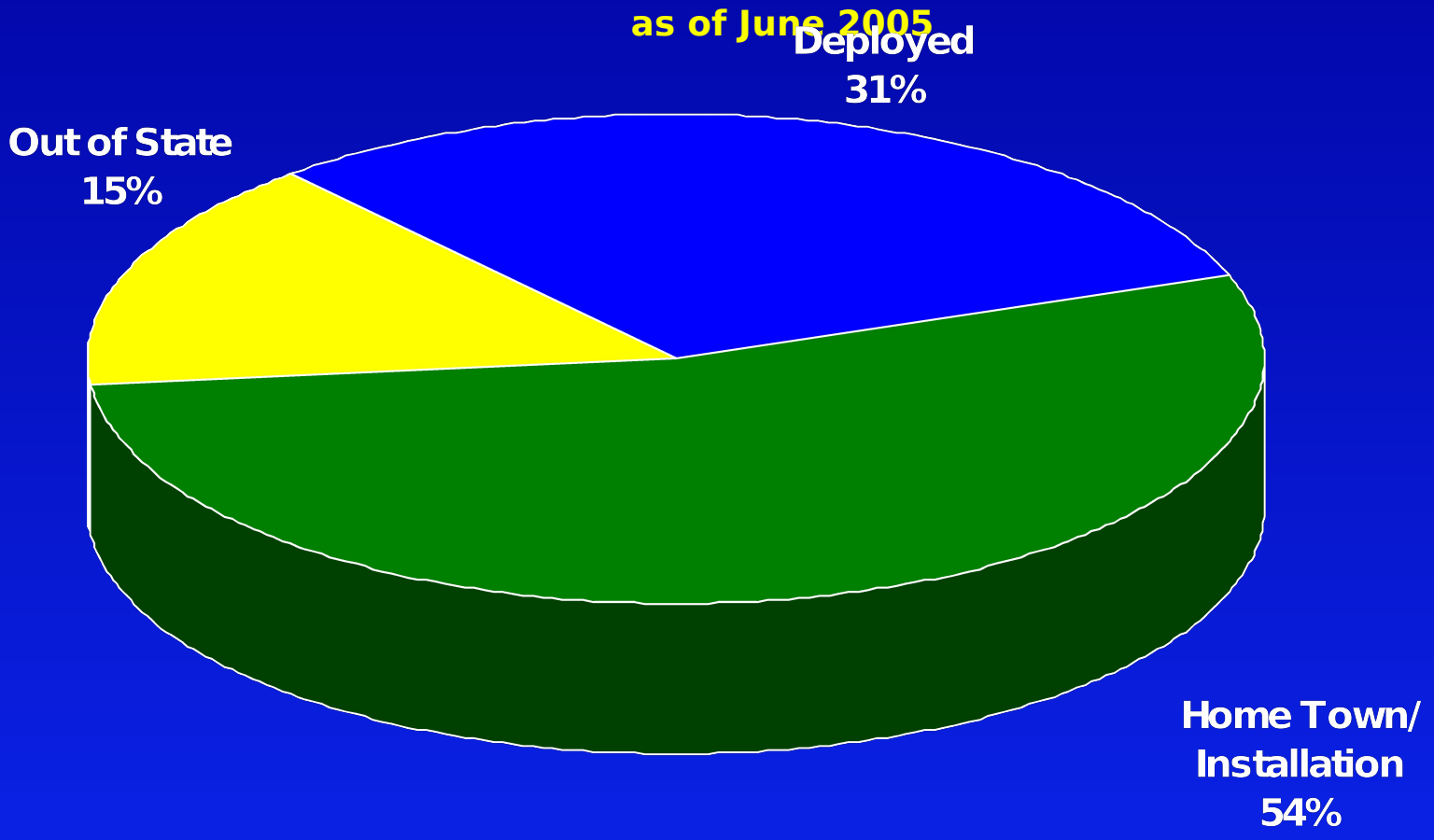


Duty Component for 2005 (Active Duty Suicides Only)

as of June 2005



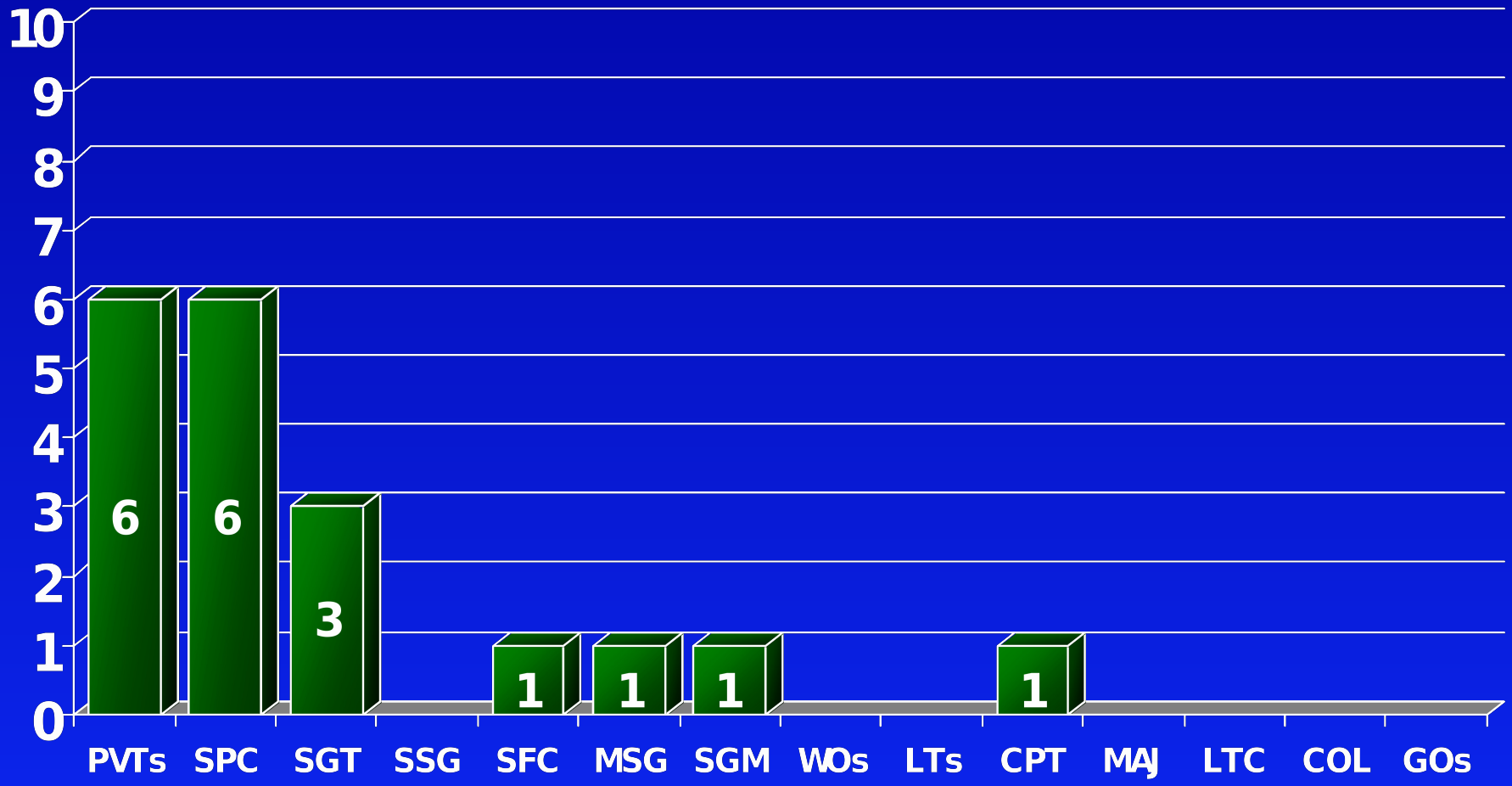
CY 05 Suicides – Location



		Home Town	Out/State	Deployed
AWOL	Confirmed	10	3	6
	0			

CY 05 Suicides - Rank

as of June 2005



Danger Signals For Suicide Risk

- Talking/Hinting About Suicide
- Giving Away Possessions/ Making a Will
- Obsession with Death
- Specific Plan/Access to Lethal Means
- Buying a Gun
- Prior attempts
- Alcohol consumption increases risk

Actions to Prevent Suicide

- Talk to the soldier supportively
- Don’t “beat around the bush”
  - If you suspect suicidal ideation, ask!
  - Talking about suicide WILL NOT provoke it.
- Ensure the soldier receives prompt medical attention

ENABLING LEARNING OBJECTIVE #4

- ACTION: Identify the different classes of stressors.
- CONDITION: Given a list.
- STANDARD: IAW FM 3-04.301

Environmental

- ALTITUDE
- HEAT/COLD
- SPEED
- TERRAIN
- WEATHER
- ERGONOMICS

Psychosocial Sources of Stress

- Some Major Events Are:
  - Marriage
  - Death of a Close Relative
  - Reassignment
  - Illness or Injury (Self or Family)

Cognitive Stressors

- How you view a stressor will effect your experience of stress
  - “All or nothing” thinking
  - Failure to focus on the here and now
  - Too many “Musts and shoulds”

Physiological Stressors

- Maladaptive behaviors over which aircrew have significant control
- Use acronym “DEATH”
  - **D**rugs
  - **E**xhaustion
  - **A**lcohol
  - **T**obacco
  - **H**ypoglycemia

Drugs

- Self Medication
- Known side effects
- Overdose risk
- Allergic reactions
- Synergistic effects

Exhaustion

- Lack of adequate sleep and rest
  - Deployments
  - Extreme environments
  - Circadian desynchronosis
- Physical conditioning
  - Aerobic
  - Anaerobic

Alcohol

- Affects judgment, thermal stress tolerance, visual acuity, perception, coordination & communication
- 12 hours “bottle to brief” and no residual effects
- Risk management approach to drinking
  - Personal risk assessment
  - Personal countermeasures

Tobacco

- Long-term:
  - Lung cancer
  - Coronary heart disease
  - Sinus infections
- Acute:
  - Carbon monoxide adds 5,000 feet to your physiological altitude
  - Affects night vision

Hypoglycemia

- Caused by lack of well-balanced meals
- Can lead to weakness, fainting, and decreased efficiency
- Overeating may also impact general health and flight performance

QUESTIONS

Q. What are four classes of stress?

A. Environmental, psychosocial, cognitive, physiological

ENABLING LEARNING OBJECTIVE #5

- **ACTION:** Select the factors that determine the impact of stress on performance.
- **CONDITION:** Given a list.
- **STANDARD:** IAW FM 3-04.301 and Flight Stress

Stress and Performance Factors

- Mental skills required by task/situation
- Stress characteristics of the situation
- Biological make-up of the individual
- Psychological make-up of the individual

Stress and Performance Factors

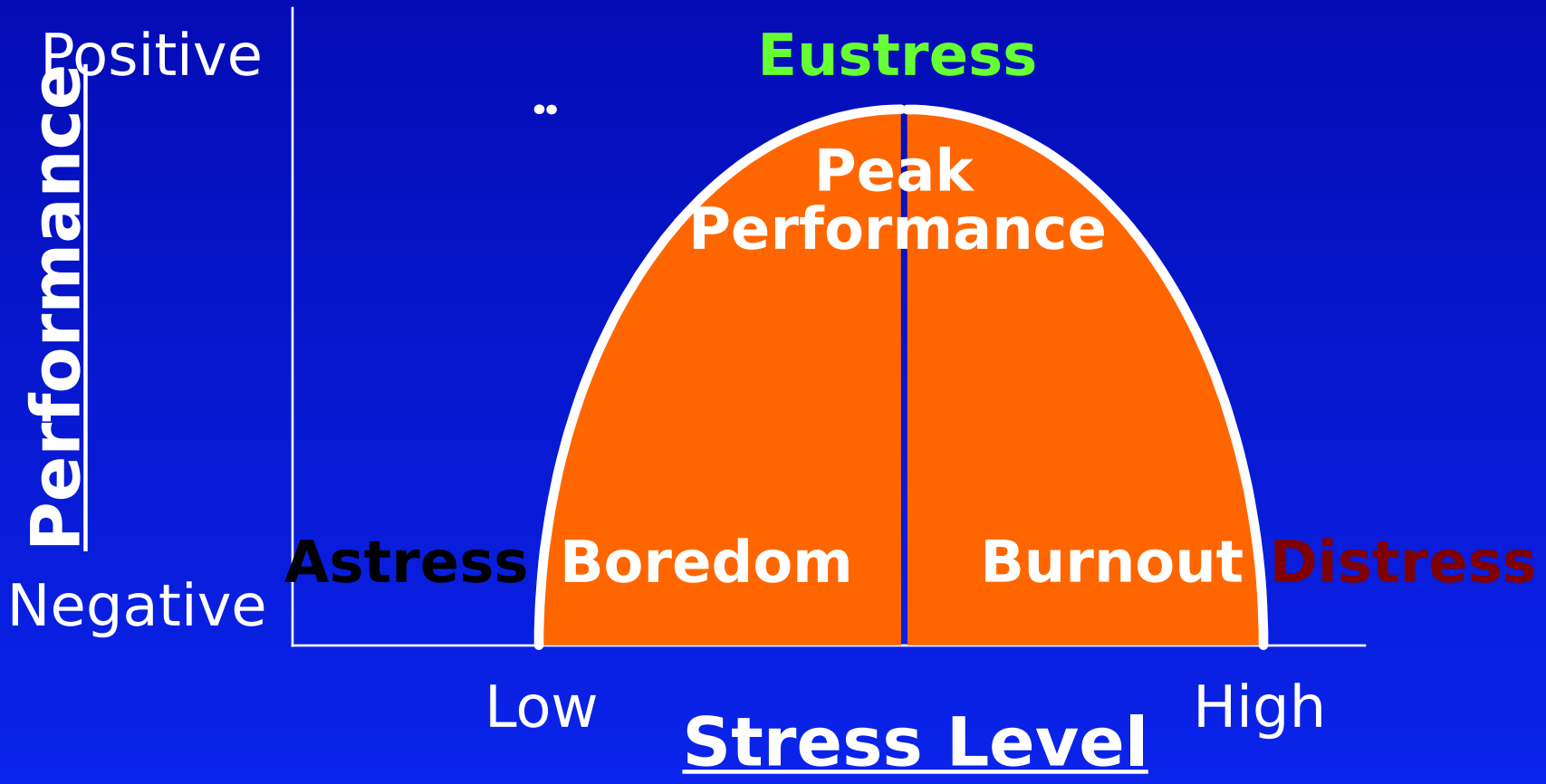
Yerkes-Dodson “Law”:

Stress and Performance Factors

Yerkes-Dodson “Law”:

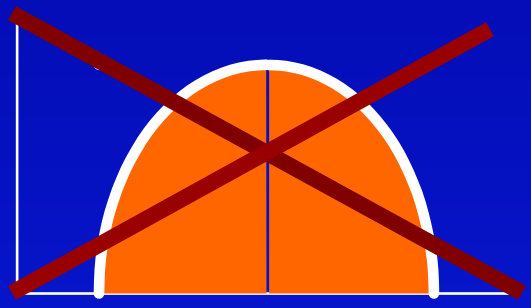
Stress and Performance Factors

Yerkes-Dodson “Law”:



Stress and Performance Factors

- This relationship is not scientifically supported
- Has to do with “arousal”
  - Coma
  - Hyperactivity
- There is no link between increased levels of stress and better performance – it always declines!!



ENABLING LEARNING OBJECTIVE #6

- **ACTION:** Select the impact of stress on pilot performance.
- **CONDITION:** Given a list.
- **STANDARD:** IAW FM 3-04.301 and Flight Stress

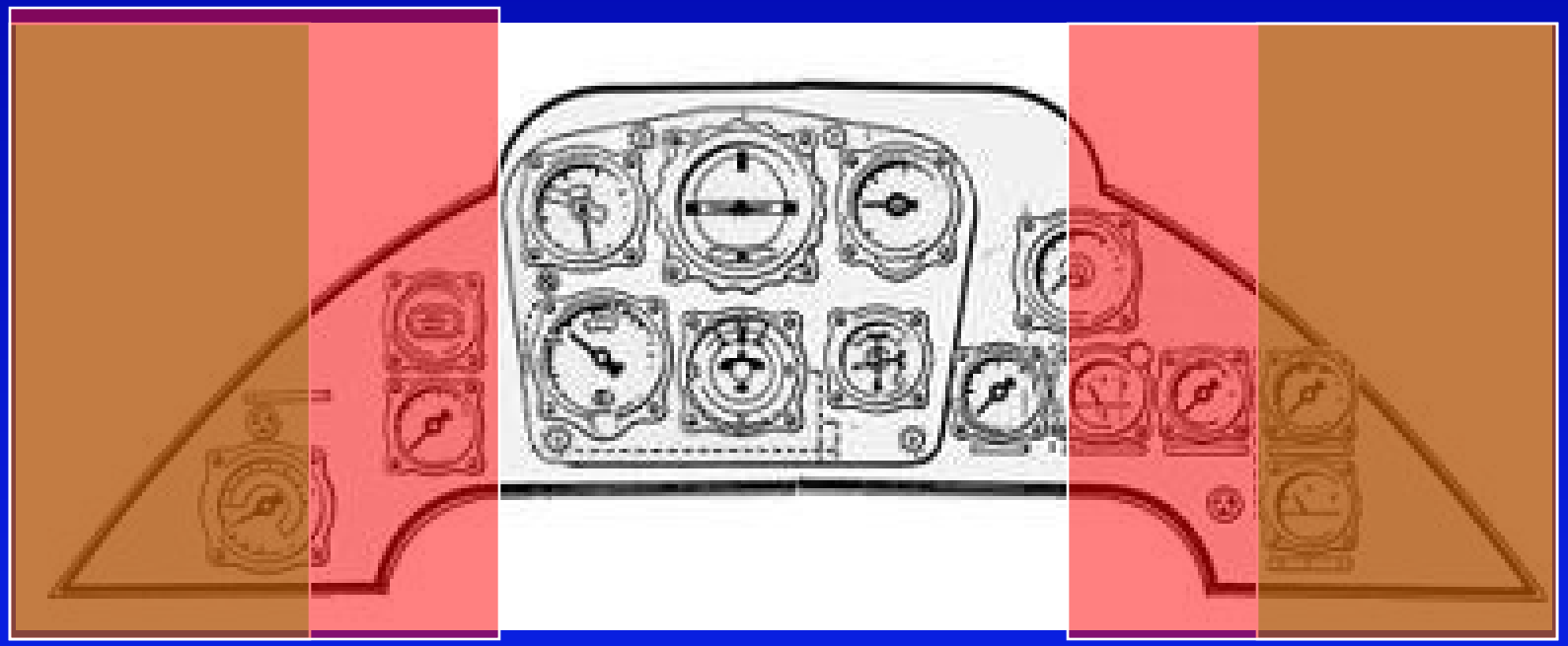
Necessary Pilot Abilities

- Psychomotor (stick & rudder)
- Attention
- Memory
- Judgment and decision making
- Prioritization of tasks
- Cockpit communication

Performance Under "Stress"

- Psychomotor
  - Decreased tracking abilities
- Attention
  - Perceptual tunneling
  - Cognitive tunneling – narrowing salience (missed radio call)
  - Task shedding – entire tasks abandoned

Perceptual Tunneling



Performance Under "Stress"

- Memory
  - Memory Capacity Declines (Short-term memory)
  - Memory Strategies Compromised
    - Simplification Heuristic
    - Speed/Accuracy Tradeoff
  - New Learning Declines – Stress Related Regression

Performance Under "Stress"

- Judgment/Decision Making
- Communication
  - Speech production (articulation, pitch, syntax)
  - Comprehension
  - Group Think

Performance Under "Stress"

- Boredom
  - Increased risk-taking behaviors
  - Vigilance declines (aspect of attention)

Performance Under "Stress"

- Boredom
  - Increased risk-taking behaviors
  - Vigilance declines (aspect of attention)

ENABLING LEARNING OBJECTIVE #7

- **ACTION:** Match individual stress coping mechanisms with the four classes of stress coping mechanisms.
- **CONDITION:** Given a list.
- **STANDARD:** IAW FM 3-04.301

Stress Coping Mechanisms

- AVOIDING STRESSORS
- CHANGE YOUR THINKING
- LEARN TO RELAX
- VENTILATE

AVOIDING STRESSORS

- Most powerful technique.
- Involves avoiding the stress or reducing exposure.
- Examples:
  - Leaders model good time management
  - Implement tough, realistic training
  - Maintain an effective PT program
  - Exercise sound judgement and decision-making
  - Good cockpit communication

CHANGE YOUR THINKING

- Practice positive self-talk
- Focus on the here and now
- Recognize the choices you make
- Avoid absolutes and perfectionism

RELAXATION

- The opposite of stress is relaxation.
- You can’t be stressed and relaxed simultaneously.
- Learn how to relax:
  - breathing
  - relaxation exercises
  - pleasurable hobbies

VENTILATING STRESS

- Exercise
- Talk it out
  - with a friend
  - your spouse
  - chaplain
  - mental health

ENABLING LEARNING OBJECTIVE #8

- ACTION: Select the factors that will decrease one's vulnerability to combat stress.
- CONDITION: Given a list of categories.
- STANDARD: IAW FM 22-51, Flight Stress

Combat Stress

- Signs and Symptoms
  - Hyperalertness
  - Fear, anxiety
  - Loss of confidence
  - ↓ performance
  - Impaired senses
  - Weakness/paralysis
  - Hallucinations or delusions

Combat Stress

- Buddy Aid
  - Reassurance
  - If no response, seek medical treatment
- Decreasing Your Vulnerability
  - Competence in your work
  - Confidence in your abilities
  - High morale, group cohesion, and esprit de corps
  - Control, or even perceived control

ENABLING LEARNING OBJECTIVE #9

- ACTION: Select the definition of fatigue.
- CONDITION: Given a list of definitions.
- STANDARD: IAW FM 3-04.301, and Leader's guide to Crew Endurance.

FATIGUE

“The state of feeling tired, weary, or sleepy that results from periods of anxiety, exposure to harsh environment, or loss of

Overkill or Prevention?

- Presley, P. (2001). Fatigue: Army aviator's willingness to utilize stimulants as countermeasures.
  - 31 experienced pilots from various airframes
  - Average flight hours = 2240.5 hours
  - Average age = 37 years
  - Average education = 15.1 years

Question: I have flown when I was fatigued

- Never 3%
- One time 3%
- Twice 6%
- 3-5 times 13%
- 5-10 times 6%
- Over 10 times 68%!!

Preston, P. (2001).

Question: I have nodded-off in the cockpit while performing duties as a pilot or PIC

- Never 48%
- One time 23%
- Twice 13%
- 3-5 times 6%
- 5-10 times 10%
- Over 10 times 0%

52%!!

Preston, P. (2001).

ENABLING LEARNING OBJECTIVE #10

- ACTION: Select the three types of fatigue.
- CONDITION: Given a list.
- STANDARD: IAW FM 3-04.301, and Leader's guide to Crew Endurance.

Types of Fatigue

- Acute
- Chronic
  - Gradually builds over time
- Motivational Exhaustion - “Burnout”
  - Results from excessive unmanaged stress
  - Restorative measures are only temporary if stress continues

ENABLING LEARNING OBJECTIVE #11

- ACTION: Select the signs and symptoms of fatigue.
- CONDITION: Given a list.
- STANDARD: IAW FM 3-04.301, and Leader's guide to Crew Endurance.

Signs and Symptoms of Fatigue

- Attention/Concentration difficult
- Feel or appear dull and sluggish
- General attempt to conserve energy
- Feel or appear careless, uncoordinated, confused, or irritable

Signs and Symptoms of Fatigue

- Cognitive deficits are seen before the physical effects are felt

ENABLING LEARNING OBJECTIVE #12

- ACTION: Select the effects of fatigue on performance.
- CONDITION: Given a list.
- STANDARD: IAW FM 3-04.301, Flight Stress, and Leader's guide to Crew Endurance.

Impairment in the Cockpit

- Reaction time increases
  - Errors in timing and accuracy
  - Not as smooth
  - Slow and irregular motor inputs
- Attention is reduced
  - Lapse or “microsleeps”
  - Tunneling
  - Need enhanced stimuli
  - Reduced audio-visual scan

Impairment in the Cockpit

- Diminished memory
  - Recall declines
  - Learning declines
- Overall poor and careless performance
- Greater tolerance for error
- Impaired communication, cooperation, and crew coordination
  - More fragmented conversations
  - Misinterpretations

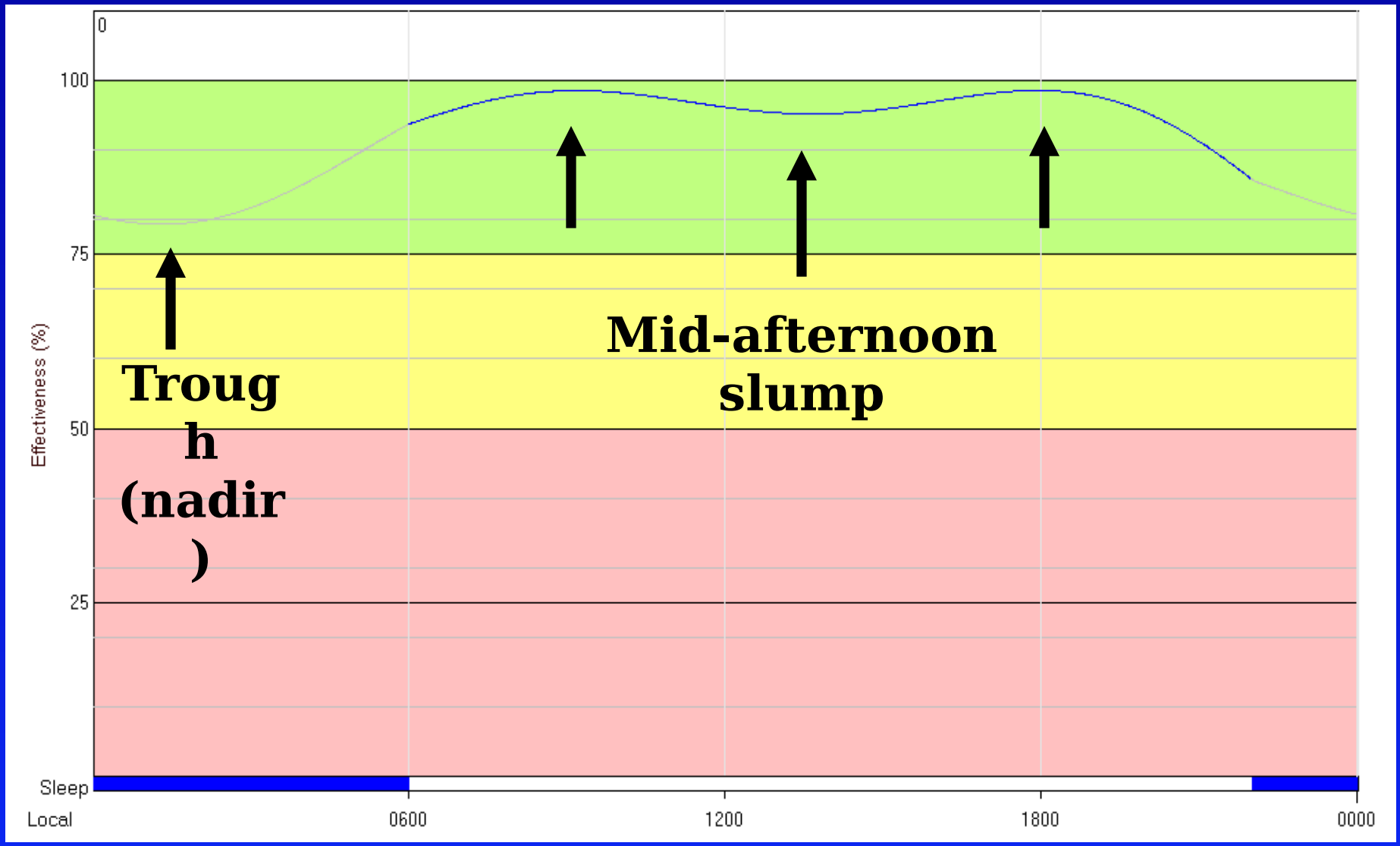
ENABLING LEARNING OBJECTIVE #13

- ACTION: Select the characteristics of the body's diurnal (or circadian) rhythms.
- CONDITION: Given a list of effects of diurnal (or circadian) rhythms.
- STANDARD: IAW Leader's guide to Crew Endurance.

Diurnal (Circadian) Rhythms

- Regulate bodily functions
  - Core Body Temperature
  - Alertness
  - Heart rate
  - Hormonal secretions
- 24 Hour Cycle
  - 0800 - 1200 hrs. Peak
  - 1300 - 1500 hrs. Decrease
  - 1500 - 2100 hrs. Increase
  - 2100 + Decrease to sleep
- "Zeitgeber"
  - Sunrise/sunset
  - Ambient temperature
  - Meals
  - Social cues

The Normal 24-Hour Day



ENABLING LEARNING OBJECTIVE #14

- ACTION: Select when an individual may be subject to circadian desynchronization.
- CONDITION: Given a list.
- STANDARD: IAW Leader's guide to Crew Endurance.

Circadian Desynchronization

- Disrupted circadian rhythms due to rapid travel across time zones (“Jet Lag”).
  - Eastward travel shortens the day
  - Westward travel lengthens the day
  - Resynchronization is faster when traveling west
- Shift work can have similar effects

ENABLING LEARNING OBJECTIVE #15

- ACTION: Select the characteristics of the sleep cycle.
- CONDITION: Given a list.
- STANDARD: IAW Leader's guide to Crew Endurance.

Sleep Cycle

- Sleep is an essential, active process.
- Sleeping brain cycles between **5 stages**
  - One complete cycle takes about 90 minutes
  - Usual 8 hour sleep period involves 5-6 cycles of REM and non-REM sleep
- Body temperature affects the duration and quality of sleep.

Sleep Cycle

- It is the timing of sleep, not necessarily the amount that is important.
- Sleep efficiency deteriorates with age
  - Older individuals spend less time in deep non-REM sleep. Night-time awakenings and daytime sleepiness result.

ENABLING LEARNING OBJECTIVE #16

- ACTION: Select the factors that determine the sleep required by the average aircrew member.
- CONDITION: Given a list of factors.
- STANDARD: IAW Leader's guide to Crew Endurance.

Sleep Requirements
Determining Factors

- We cannot determine our own impairment from sleep loss
- Average human sleep length is 7-9 hours/day
- Sleep length can be reduced 1-2 hrs without performance decrement over extended period
- 5 hours/night is absolute minimum for CONOPS
- Some individuals may tolerate as little as 4 hours/ night

Sleep Requirements
Continued

- Sleep restriction decisions should consider:
  - Complexity of the job
  - Potential for loss from errors
  - Individual’s tolerance to sleep loss

ENABLING LEARNING OBJECTIVE #17

- ACTION: Select the strategies for preventing fatigue.
- CONDITION: Given a list of strategies.
- STANDARD: IAW FM 3-04.301, Fundamentals of Aerospace Medicine, and Leader's guide to Crew Endurance.

Prevention of Fatigue

- Get adequate sleep
- Prevent/control desynchronosis
  - Maintain consistent schedules of sleep, daylight exposure, and naps.
- Control sleeping environment
  - Sleep in darkness.
  - Control noise.
  - Control room temperature.

Prevention of Fatigue

- Build endurance through physical conditioning and stress coping
- Practice good nutrition
- Practice good sleep hygiene
  - Use the bed for sleep and sex only
  - Establish a bedtime routine
  - Avoid checking the clock

Napping

- Even 10 minute naps are restorative.
- Longer naps are better but may leave you feeling more tired (“Sleep Inertia”) for 20-30 minutes after awakening.
- Best to nap when body temp is low (around 0300 and 1300).
- Practice napping as prevention.

ENABLING LEARNING OBJECTIVE #18

- ACTION: Select the appropriate treatments for sleep deprivation and fatigue.
- CONDITION: Given a list of treatments.
- STANDARD: IAW FM 3-04.301, and Leader's guide to Crew Endurance.

Treatment

- Rest and Natural Sleep
  - Alcohol is the most widely used sleep aid in the US
  - It suppresses REM sleep
- Keep sleep area quiet, dark, and cool
- Change or rotate duties
- Pace yourself
- Avoid complex tasks
- Delegate responsibility
- Use physical exercise
- Nutrition
- Remove from flying duties

SUMMARY